unique experience. Nothing of especial note, however, was brought to light.

The whale was evidently an aged "bull" that had been driven from the "herd" by the younger males, had led a "maverick" existence for some time and had strayed far from his native haunts. It is probable that he had met his fate through an ill-advised pursuit of a school of cuttle-fish or squids into a shallow bay, where he became stranded in soft black mud, which soon filled his lungs and literally drowned him.

I have been able to find no previous record of a sperm whale coming ashore on the Gulf of Mexico. If there are other cases I should be glad to learn of them.

H. H. NEWMAN

AUSTIN, TEXAS

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SECTION G—BOTANY, BOSTON MEETING

As in previous years, Section G held its sessions in alternation with the Botanical Society of America. At Boston a further system of interlocking was made necessary by the program of the newly organized American Phytopathological Society, but it was found by making mutual concessions that conflict of programs could be reduced to a minimum. One joint session was held with the American Phytopathological Society. In the enforced absence of Vice-president Penhallow on account of illness, Dr. B. M. Davis, of Cambridge, was selected vice-president pro tem. The address of the retiring vice-president, Professor H. M. Richards, entitled "On the Nature of Response to Chemical Stimulation," has been published in full in SCIENCE. This address was followed by a symposium on botanical gardens, participated in by William Trelease, N. L. Britton, W. F. Ganong, D. S. Johnson and A. F. Blakeslee; it is expected that this symposium will be published in full in SCIENCE.

The following officers were chosen:

Vice-president—Professor R. A. Harper.

Member of the Council—Professor A. D. Selby.

Member of the Sectional Committee (five years)—Professor H. M. Richards.

Member of the General Committee—Professor G. F. Atkinson.

Abstracts of the technical papers follow.

Further Observations on the Nature of the Fertile Spike in Ophioglossaceæ: M. A. CHRYSLER.

The writer's view as to the morphological nature of the fertile spike in Ophioglossaceæ, derived from an anatomical study, receives striking confirmation from certain specimens of *Botrychium obliquum* collected in New Hampshire. These bear either a pair of fertile spikes in place of the normal one, or a pair in addition to the normal one and inserted above it. The vascular supply of the pair of spikes indicates that they represent a pair of fertile leaflets, and the single spike represents a fused basal pair of fertile leaflets. In some cases the two spikes of the pair are fused for part of their length, and in other cases part of the ordinarily sterile segment is fertile. These facts in connection with other considerations lead to the conclusion that the fertile spike of *Botrychium* and *Ophioglossum* represents two fused basal pinnæ of a fern leaf.

Change of Sex in Humulus Lupulus not due to Traumatism: W. W. STOCKBERGER.

The bisexual inflorescence of *Humulus Lupulus* L. was the subject of a brief paper read by the writer before the Botanical Society of America at the Chicago meeting in 1907–8. Since that time some experiments have been performed and data from other sources collected which tend to refute the theory that traumatism is the cause of this abnormality. Removal of the tap root, severe pruning, removal of portions of the crown and cutting back the vines after they had attained a length of four to six feet all failed to cause any change in the normal production of the flowers.

Further, the experiments show that a plant which once produces the abnormal type of inflorescence will continue to do so through successive seasons and will transmit this tendency to its asexual progeny. So far as observation goes, it appears that only plants bearing pistillate flowers are subject to reversal of sex. In an experimental plot of 1,400 seedlings all the plants were apparently normal at first and bore either staminate or pistillate flowers respectively. Later in the summer some of the plants bearing pistillate flowers developed staminate flowers also. Since none of these plants were subjected to the vigorous traumatic treatment described above it is held that some factor other than traumatism produces the sex reversal.

The Taxonomic Value of the Cephalodia in Certain Species of Stereocaulon: LINCOLN W. RIDDLE.

Stereocaulon paschale (L.) Ach. and *S. tomentosum* Fr. have been separated hitherto chiefly by

the amount of tomentum present on the podetia. This, being a variable character, has led to much confusion. It is suggested that the types of cephalodia, being mutually exclusive, may furnish a basis for distinguishing the species. *Stereocaulon paschale* has conspicuous, gray cephalodia containing *Stigonema;* while in *S. tomentosum* they are minute, deep green and with an alga of the *Nostoc* type. In only one case, out of 103 specimens studied, were both types found on the same plant. A statistical study based on the development of tomentum, the position of the apothecia and the type of cephalodia shows that cephalodia are present in about 90 per cent. of the specimens, being more constant in their occurrence than apothecia, and that they are correlated with the development of tomentum to a sufficient degree to warrant their use as a criterion for separating the two species of *Stereocaulon* named. It may be added that *S. alpinum* Laur. has the same type of cephalodia as *S. tomentosum;* while *S. coralloides* Fr. and *S. denudatum* Flke. have the *paschale* type.

Cell and Nuclear Division in Closterium: B. F. LUTMAN.

Closterium, like many of the algæ, is only found in division at night from 10 P.M. to 4 A.M.

The first external sign of division is a pinching in of the chromatophore about two thirds of the way from either tip. No external change is visible in the nucleus at this time. Later, the nucleus apparently disappears and across the middle of the *Closterium,* in the place formerly occupied by it, appears a broad granular band. The cell wall now begins to grow in across the center of this band separating the two halves. In stained whole mounts the two nuclei resulting from division can now be seen making their way back immediately under the plasma membrane to the point where the chromatophore is being pinched in two, in either half. The two halves now break apart, and the new ends are rounded out at first, but rapidly grow and become pointed, making the two halves of the new *Closterium* symmetrical. The entire process takes about four to six hours, as few asymmetrical ones are found at 8 A.M.

The chromosomes are formed from a spireme whose origin is in the fine reticulum around the compound nucleole. There are about thirty to forty of them, slender rods. They arrange themselves on the equatorial plate of a spindle with broad poles, similar to that described for *Spirogyra.* In the reconstruction stages they seem to unite end to end to form a dispireme. They spin out and become fainter and the compound nucleole reappears. There is no evidence that the chromosomes have their origin from the nucleole. The two nuclei move away from each other around the chromatophore, between its ridges, to take their place at the middle of the new halves.

Cell division is by the growth inward of kinoplasmic material which lays down the new wall. The wall cuts across the cell at right angles to the side walls. The central spindle fibers disappear and have nothing to do with its construction.

Corallorhiza and Mycosymbiosis: BENJ. C. GRUENBERG.

Several species of *Corallorhiza* store starch in the rhizome; this is secondary starch, that is, it is derived from organic materials in the soil or humus and is not the direct result of photosynthesis on the part of the plant. Stomata are present in all parts of the epidermis; these are probably active and must be concerned with gas exchanges involved in respiration. The trichomes and epidermis of the rhizome serve for absorption of materials from the soil. It is not necessary to assume that any species of *Corallorhiza* is dependent upon its fungal symbiont for its nutrition. The symbiosis is indeed a constant character of the species examined, but it probably results from the habit of the fungus; it is at any rate not necessary to assume that it is obligatory for the maintenance of the orchid. The fungus may be of assistance to the orchid by furnishing conditions favorable to the germination of the latter's seeds; but it is not improbable that other conditions may also stimulate the seeds to germinate. It is not certain that the fungus is indispensable to the orchid in this connection. The permanent association does not seem necessary for the germination since there are no hyphal connections between the rhizome and the inflorescence. The infection of the rhizome takes place about the time of germination. Hyphæ traversing the trichomes are on their way out; these connections may serve the fungus as means of propagation, but need not be assumed to be of use to the orchid in nutrition. The "digestion" of hyphal masses within the cortical cells may be considered as a means for preventing the spread of the fungus to the point of injuring the orchid; it need not be assumed to be necessary for the nutrition of the orchid. The fungus is probably an internal saprophyte. The mycosymbiosis may have different significance in other families of plants. There is in preparation a "host" index and bibliography of all mycorhizas that have been described.

The Origin of the Primary Bulb in Erythronium: Frederick H. Blodgett.

In the mature seed the embryo of *Erythronium* is a globose mass of cells, without differentiation, slightly pointed toward the micropyle. The seed remains dormant during the summer. The embryo begins to elongate with the coming of the late summer rains. The tip of the cotyledon is early organized as a haustorium, and absorbs the reserve cellulose along the line of elongation. When the embryo has elongated to half the length of the seed the stem apex may be recognized.

The stem apex is located in a narrow transverse slit situated just behind the radicle. By the growth of the cotyledon above the slit, the radicle and the stem apex are forced into the soil. The hypocotyl takes no part in the descent of the stem apex. With the exhaustion of the reserve food of the seed the descent of the stem apex stops. The primary root pushes forward from the end of the descending axis, while the cotyledon frees its tip from the seed coats and reaches upward into the air. One root only is formed by the seedling, and this is unbranched, in our species.

A dropper (primary runner) is formed from the walls of the slit and cells immediately adjacent, and carries the stem apex (primary growing point) forward from the base of the descending axis as the terminal bud in the dropper. The walls of the dropper are equivalent to the first scale leaf of the primary growing point, fused along one side to the stalk of the bud through which vascular connection is maintained with the cotyledon and primary root. The relation of parts is similar to that of the raphe to the rest of the ovule in anatropous ovules.

The primary growing point within the dropper sheath organizes a second scale leaf, the first scale being the dropper sheath.

The second scale leaf encloses the growing point, and these form the bulk of the primary bulb; the sheath of the dropper forms the husk about the bulb. The starch for storage in the growing bulb is obtained through the photosynthetic activity of the cotyledon, acting as the first foliage leaf. The death of the other parts of the seedling leaves the terminal bud of the dropper isolated in the soil as the primary bulb, and marks the end of the first vegetative period of the cycle from seed to flower.

Some New Hybrids and their Bearing on the Classification of Wheat: B. C. Buffum.

The classification of wheat has gone through several changes since the first division by Linnæus into fall and spring species. Hackel recognizes three true species and two subspecies of *Triticum*.

Should some botanists of the present apply their ideas of specific characters to cultivated plants we should have many species of wheat. It is doubtful if any term used in science means less to the thoughtful student than the word species.

My recent work with wheat shows that we may accept the species of Hackel from the old standpoint of their action in cross pollination and yet all have the same origin.

From a single hybridization between a mutating *Triticum sativum* (winter wheat) and a mutating *Triticum dicoccum* (winter emmer), I have secured a complete breaking up of wheats into all the species and types since the beginning of time, and in addition produced infertile hybrids, monstrosities and new types not intermediates. The second generation has given well-defined specimens of *Triticum monococcum*, *T. dicoccum*, *T. spelta*, *T. polonicum* and almost if not quite every well-marked type of *T. sativum*, including various colored bearded and beardless, square head, club and long-headed forms, with every arrangement and shape of glumes and spikelets.

The evidence is conclusive that all wheats have developed from not more than two and probably from a single form.

The question arises should we accept one species or are we justified in using every variation as a specific difference which would divide wheats into many species, and if so, where may the line be drawn?

The Closing Response of Dionœa muscipula Ellis: W. H. Brown and L. W. Sharp.

The closing response of *Dionœa* depends upon the intensity rather than upon the number of stimuli, the number of stimuli required varying in the inverse order of their intensity.

Response is normally brought about by the compression of certain cells at the bases of the sensitive hairs, but the compression of other cells of the blade also causes closure, and it is probable that the latter cells are equally sensitive with those at the bases of the hairs, as is indicated by the effect of electrical and thermal stimulation.

The closing response follows the application of mechanical, electrical or thermal stimulation. It also follows a combination of stimuli of two kinds when consecutively applied, the individual stimuli being of an intensity such that either alone would be insufficient.

The effect of mechanical stimulation is due to a compression of cells, and not to contact with a

hard object, nor to continued pressure, nor to release of pressure. The failure of the leaf to respond to shaking is probably connected with the small inertia of the sensitive hairs, and the slight resistance offered by the air to their passage through it.

Water at room temperature causes closure only when it bends a sensitive hair.

After one mechanical stimulus there is a short period during which a second mechanical stimulus is ineffective.

Effects of Acidity of Culture Media upon Morphology in Species of Penicillium: CHARLES THOM.

Increasing recognition of the economic importance of saprophytic forms, such as species of *Penicillium*, lends interest to the study of their metabolic activities. Although production of certain enzyms determines the ability to digest particular forms of food, the elements necessary to normal growth of any of these forms are present in nearly all kinds of fruit, meat and vegetables, or other food products. The presence or absence of a particular species of *Penicillium* as an agent of fermentation or decay, is therefore determined by its tolerance of other factors. Among these are temperature, relative humidity of the atmosphere, percentage of water in the substrata, the forms of carbohydrate present, the concentration of osmotic substances, and the alkalinity or acidity of the media. One of the easiest of these to demonstrate relates to the alkalinity or acidity of the medium. The cultures shown represent a series of conditions illustrating the range of this tolerance for certain species of *Penicillium*.

Using tubes containing 10 c.c. each of a medium neutral to phenolphthalein, alkali has been added as normal sodium hydroxid, and acid as normal lactic acid. The change in the constitution of the medium can thus be given as cubic centimeters of normal acid or alkali per ten of medium. Uniform volume is maintained by increased concentrations. The range of tolerance in the species studied is from 2 c.c. of alkali per 10 c.c. of medium to 5 c.c. of normal acid to the same amount of medium. Within this extreme range, most species are much more closely restricted. Very few species grow to any degree in plates alkaline to phenolphthalein (*P. brevicaule* and its allies). Of the very common green species but few fruited freely in alkali as strong as a tenth normal. Nearly all grow best between the neutral point and an acidity approximately equal to tenth normal. The most widely reported forms show naturally the greatest tolerance (*P. roqueforti*, *P. expansum*).

The inhibiting effects of acid vary with the species and with the kind of acids. The first effect noted is usually the retardation of growth and especially of the production of colored spores. In some the retardation is temporary; again it reduces the final size of the colony. There results a gradation from the normal colony to very small colonies but with typical morphology. In others, a concentration is soon reached which inhibits the production of colored spores entirely. In others the production of bright colors in the substratum is partly or entirely stopped. The typical morphology of fruiting areas is often greatly changed.

Testing their tolerance to acid emphasizes the close relationship of certain groups of forms and offers a very useful accessory to the description of species. Along with other cultural evidence it seems to show that the presence of special forms as agents of decay in certain fruits (*P. italicum* and *P. digitatum* on citrus fruits), is due not so much to adaptation to the fruit as a form of food as to tolerance of the other substances present. It should be noted that in synthetic media it can be readily shown that the standard formulæ (Raulin's, Cohn's, Uschinsky's, Czapek's) are extremely dilute and in no sense to be regarded as the optimum for mold growth. In fact in solutions of non-toxic substances much greater concentrations may be used than any of these formulæ call for and bring about correspondingly greater masses of typical mold growth. The responses to acidity are much more rapid and radical in the character of the growth obtained, hence quickly reach a diagnostic value in most species.

Effect of Various Gases and Vapors upon Etiolated Seedlings of the Sweet Pea: LEE I. KNIGHT, R. CATLIN ROSE and WILLIAM CROCKER.

The effects of impurities of laboratory air upon the etiolated epicotyls of seedlings of various legumes have been described by a number of German investigators. The effects are three: decrease of rate of growth in length, swelling of the region growing while exposed to the impurity and a horizontal placing of region. These investigators assume that almost any gaseous impurity, even in low concentration, will produce this three-fold response. The accompanying table shows determinations made with eleven gaseous impurities upon the sweet pea, Earl Cromer. The horizontal placement induced by ethylene, illuminating gas and acetylene seems to be an induced diageotropism.

Gas Used.	No. of Parts per Million of Atmospheres to Cause Considerable—		
	Inhibition of Growth.	Swelling.	Horizontal Placing.
Ethylene	.1	.2	.4
Illuminating gas	2.5	5	10
Acetylene	100	250	500
Hydrogen sulfid	500		
Sulfur dioxid	1000		
Carbon disulfid	2000		
Turpentine	2500	5000	
Benzene	4000	8000	
Ethyl ether	10000	40000	
Chloroform	10000	20000	
Benzine	24000	20000	

A New Method of Detecting Traces of Illuminating Gas: LEE I. KNIGHT, R. CATLIN ROSE and WILLIAM CROCKER.

It has been shown that 12.5 parts of illuminating gas or .5 part of ethylene per million of air will play havoc with flowers of the carnation. Chemical tests will detect no less than 100 parts of illuminating gas per million of air. In a number of cases known to us greenhouse men have been unable to determine, through lack of a delicate test, whether illuminating gas was the cause of serious injuries to their crop. In these cases there was much evidence that gas leaking from imperfect pipes, seeping through the ground up into greenhouses was the cause of the injury. The injuries occurred in cold weather when the ground was frozen and the houses could be little aerated and they ceased with the repair or removal of the defective pipes. We believe from our results reported in the paper above that the etiolated epicotyl of the sweet pea will furnish a delicate and accurate test for traces of illuminating gas.

The Stele of Osmunda cinnamomea: J. H. FAULL.

Nodal rays occur in the xylem of seedlings of *Osmunda cinnamomea*, and eventually the edges of one of them close around the intruding parenchyma to form a "stelar" pith. The "extrastelar" pith arises as an eccentric pocket at the inner entrance to a leaf-gap. Its connection with the cortex has been observed in the adult only. Branching is not a seedling character. The seedling stage is long drawn out, and variable. Internal phloem has been found in abnormal unbranched plants.

There is a marked tendency in the Osmundaceæ for the xylem to encroach on the pith. Thus in *Osmunda cinnamomea* one finds internal strands of xylem, closure of the inner ends of medullary rays (in reduced plants to the extent of simulating the cladosiphony of *Osmundites Dunlopi*, etc.), parenchyma pockets in the xylem (characteristic of the family), projections of the internal endodermis in these pockets, etc., all of which indicate a tendency towards "cladosiphony" in the Osmundaceæ, and a possible point of contact with the Gleicheniaceæ.

The facts connected with the stele of *O. cinnamomea* are held to support the theory of the reduction of the osmundaceous stele from an amphiphloic siphonostele.

The Ontogeny of Helvella elastica: W. A. MCCUBBIN.

The fruiting body arises from aggregated masses of the mycelium. It is enclosed at first by a definite velum which early degenerates. Throughout life a layer of club-shaped palisade hyphæ covers the whole surface. Scattered throughout all parts of the interior except in the stem, are large irregular cells serving apparently as storage organs.

The ascogenous hyphæ are differentiated from ordinary hyphal filaments and form a subhymenial layer. These ascogenous hyphæ produce lateral branches from whose 2-nucleate, terminal cells the usual 4-nucleate hooks are formed.

The process from the antepenultimate cell of this hook may, without fusion of its two nuclei, form a second and similar hook, and this series may extend to at least a sixth, the process from the last, after nuclear fusion, becoming the ascus. Thus the two nuclei uniting to form the primary ascus nucleus are separately descended from the two in the terminal cell of the ascogenous hypha.

In any hook of a series the terminal and antepenultimate cells may fuse, their nuclei passing into a process arising from the terminal cell. This process is equivalent to that arising from the penultimate cell and becomes likewise either an ascus or another hook.

An Unusual Walnut: IRA D. CARDIFF.

Two instances of peculiar walnuts have come to the attention of the author: one from a tree of northern Indiana and the other from a tree of southern Tennessee. The trees were found to be walnut (*Juglans nigra*) in essentially all but their nut characters. The nut itself, externally at least, is very different in appearance from a walnut. The basal portion resembles very closely a walnut while the apical portion resembles a hickory nut, showing the four furrows that divide the external shell into its four valves. These furrows, however, do not extend entirely through the

endocarp. Laymen have assumed that these nuts are hybrids between the walnut and hickory, *i. e.*, the trees bearing them were true walnuts while the pollen involved in fertilization was from neighboring hickories. In face of known morphological facts this is impossible. The author expects to make a study of this matter from all view points. The purpose of this preliminary statement is chiefly to call attention to these plants and request any one having information of similar ones to kindly report to him at Washburn College, Topeka, Kans.

Studies upon Oxidases: H. HASSELBRING and C. L. ALSBERG.

The study is a by-product of the investigations still in progress of a disease of cabbages and spinach resembling in some respects the mosaic disease of tobacco. As in the latter there seems to be an increase in the oxidizing power of the juice of the diseased areas. By Woods this phenomenon was referred to an increase in oxidase content. To the authors this did not appear to be the only explanation conceivable. It was possible that the oxidase content was only apparently increased, the seeming increase being in reality due to a decrease of anti-oxidase. The anti-oxidases were therefore studied. It was found that egg albumen and blood serum inhibit these plant oxidases and that this inhibition can be prevented if the albumen or serum is first treated with weak acid. It was further found that the addition of coagulable protein to a plant extract varies greatly the ease with which the oxidase is destroyed by heat, probably because of the inclusion of the enzym in the clot. This may account for the fact that plant oxidases are less readily destroyed by heat than animal oxidases, for plant extracts contain as a rule less coagulable protein than those from animal tissues. These observations led to an investigation of oxidase zymogen. Woods made the very remarkable discovery that a plant extract which has lost its oxidizing power as the result of boiling may recover that power on standing some hours. Woods thought that the enzym was destroyed but the more resistent zymogen remained forming fresh enzym subsequently. We found that if a heated extract be centrifugated right after heating, and the clear liquid pipetted off from the coagulum, the clear liquid did not acquire any oxidizing power on standing, while that portion of the liquid containing the coagulum did recover its oxidizing power. It is possible, therefore, that we have to deal not with a zymogen but with the inclusion of the enzym in the clot and its subsequent leaching out on standing.

Some Teratological Features of the Coniferæ: ROBERT BOYD THOMSON.

A new classification of the conifers, the outcome of recent research, has been suggested by the writer. In this the Taxaceæ and the Araucarineæ are associated, the group being characterized by a simple megasporophyll. The Abietineæ, Taxodineæ and Cupressineæ constitute the second group. These exhibit complexity in the structure of the seminiferous scale. Teratological features so far reported are practically confined to the latter, the diplosporophyllous group. These include androgyny, prolification or percrescence of the axis, and modification of the seminiferous scale, the latter often being replaced by a leafy shoot. By many the last of these features, especially, is considered as affording evidence of the brachyblast character of the ovuliferous scale. The writer's observations on numerous hermaphrodite cones of *Pseudotsuga mucronata* confirms and extends this conception. In the aplosporophyllous series, on the other hand, certain teratological features have been found that afford confirmation of the simplicity of the cone scale.

On the Distribution and Origin of Ray Tracheids in Pinus Strobus and P. resinosa: W. P. THOMPSON.

Ray tracheids are characteristic features of certain coniferous woods, notably the pines. A detailed study of their regional distribution in a soft and a hard pine (*P. Strobus* and *P. resinosa*) shows their virtual absence from such primitive places as the stem and root of the seedling, the young branch of the adult and the axis of the seed cone. Their shape and character on first appearance, their mode of development at the cambium, and certain peculiarities of their adult form, demonstrate that they originate from tracheids. These, in the course of specialization, become shortened, radially arranged and intimately associated with the parenchyma cells of the ray. Their extreme specialization is reached in the short buttressed cells of the hard pines.

The knowledge of their distribution and origin in the forms studied supplies a basis for a determination of their general phylogenetic significance.

The following papers were read by title:

On the Organization and Reconstruction of the Somatic Nuclei in Podophyllum peltatum: J. B. OVERTON.

Cleistogamy in the Genus Muhlenbergia: AGNES CHASE.

The Chart Method in Taxonomy: Frederic E. Clements.

Evaporation in its Relation to the Prairie at Lake Okoboji, Iowa: B. Shimek.

Alpine Plants and Evaporation: Charles H. Shaw.

The following papers represent the contribution of Section G to the joint session with the American Phytopathological Society:

A Spinach Disease caused by Heterosporium variabile: Howard S. Reed.

Early in 1909 a serious leaf spot was found on spinach in the trucking region about Norfolk, Va. Investigation showed that it was due to *Heterosporium variabile.* This fungus seemed to occur only where other fungi had previously attacked the leaves, and thus confirms views of previous investigators concerning its weak parasitism. The fungus hyphæ when once within the cell spread through the protoplasm in a remarkable manner. The effect of the fungus on the anatomy of the leaf and the process of spore formation have also been studied. Inoculations with pure and mixed cultures confirm previous statements of the parasitism of the fungus.

A New Species of Endomyces: Charles E. Lewis.

The fungus which is described in this paper was discovered while the writer was engaged in a study of fungi associated with apple decay at the Maine Experiment Station. According to its manner of fruiting, this fungus should be classified in the genus *Endomyces* but it does not agree in its characters with any described species.

This fungus grows readily and fruits abundantly on a large number of culture media. The characters by which the fungus is classified have not been changed by growing it on different culture media. The spore sacs, or asci, each containing four spores, have been found in all the cultures, but some media have been found more favorable for their development than others.

The details of spore formation are difficult to make out owing to the small size of the asci and of the nuclei, but they have been studied to some extent.

Three Species of the Type of Æcidium cornutum Pers.: Frank D. Kern.

The name *Æcidium cornutum* has until recently been made to include practically all of the cornute *Rœstelia.* It is now known that in Europe two species have been here confused while in this country there have been three. The identity of these three species has now been worked out and their biology and morphology are discussed in this paper. The original *Æcidium cornutum* Pers. is found to occur only on species of *Sorbus.* The species which has been confused with this in both Europe and America occurs on species of *Aronia.* The third species, which is known only in America, grows on various species of *Amelanchier.* The knowledge of the life-histories of these three species will now permit many references in mycological literature to be straightened out.

Present Status of the Cotton Anthracnose Investigation at the South Carolina Experiment Station: H. W. Barre.

This paper includes the different phases of investigation as follows:

1. The vitality of the fungus under field conditions as shown by cultures and by germination of spores.

2. The method of infection of the seedlings.

3. The method of infection of the bolls as shown by (*a*) inoculation from pure cultures by puncture, (*b*) inoculation from pure cultures by spraying with spores from pure cultures suspended in sterile water (1) in bloom; (2) bolls in various stages of development.

4. The occurrence of the fungus on the inside of living seeds. (*a*) Method of entrance into the seed. (*b*) location in same; (*c*) production of spores beneath the seed coats; (*d*) development of diseased seedlings from such seed.

A Nectria Fruiting upon the Earth: J. B. Pollock.

The life history of the *Nectrias* is of considerable importance both from the point of view of pure science and of plant pathology. The *Nectria* in question was found developing on the surface of earth in which pine seedlings had dropped off with a fungus belonging to the form-genus *Fusarium,* presumably *Fusarium Pini.* It seems probable that the *Nectria* is the so-called perfect form of this species of *Fusarium.* However, this has not yet been proved.

Pine seeds were planted in pots and the soil inoculated with soil from an infected seed bed. Shortly after the seedlings came up they were attacked by a *Fusarium* which agreed essentially with *Fusarium Pini.* Some seedlings survived the attack and the pots were allowed to stand over more than two months in the greenhouse. At the end of that period small and very inconspicuous reddish bodies were observed scattered all over the surface of the soil in the pots. These were peri-

thecia of a *Nectria*. None of them grew upon the dead seedlings but directly on the soil. There was no stroma and no subiculum, though some hyphæ might be found radiating from the perithecia. The experiment was repeated, using infected soil and again the perithecia appeared in a little more than two months. The attempts to grow the ascospores were unsuccessful, perhaps chiefly because of the great numbers of bacteria which developed. Perithecia appeared upon two control pots out of fourteen, as well as upon all fourteen of the infected pots. The control pots stood beside the inoculated pots on the bench in the greenhouse. At the present time the connection between the *Nectria* and *Fusarium Pini* is not absolutely established, but seems very probable.

A Barley Disease: L. H. PAMMEL, CHARLOTTE M. KING and A. L. BAKKE.

During the past season a parasitic fungus made its appearance upon barley, during the early part of July. This new disease manifests itself in the form of brownish circular or somewhat elongated dark-colored spots. The leaves soon become brown. The long cylindrical dark brown spores have from seven to ten divisions and measure 105–130 μ × 15–20 μ. Cultures were made and inoculation experiments demonstrated that the fungus was parasitic upon barley but not upon corn. Hence the disease is different from the *Helminthosporium teres* found on corn and the *H. turcicum*. The spots of *H. graminum* consist of longitudinal striæ of yellowish green color; the spores of this species measure 75–95 μ × 15–17 μ.

Notes on some Diseases of Coniferous Nursery Stock: CARL HARTLEY.

Damping off of coniferous seedlings is commonly caused in this country by *Fusarium*, and favored by moist conditions. In a Nebraska nursery *Rhizoctonia* sp. and a fungus which appears to be *Pythium DeBaryanum*, have been found in diseased seedlings, and inoculations indicate the ability of both to kill germinating pine seeds and to cause damping off. A great deal of damping off occurred under very dry conditions. A parasitic leaf blight on older seedlings was found to be favored by crowding and dry soil, and prevented by the use of shade frames.

Fomes annosus and Two Species of Gymnosporangium on Juniperus virginiana: CARL HARTLEY.

Fomes annosus, a very dangerous root parasite in European coniferous forests, has been reported by Spaulding as parasitic on *Pinus Strobus* and *P. rigida* in New England. It is now found to cause the death of *Juniperus virginiana*, and apparently also of *Pinus tæda*, in Delaware.

Gymnosporangium germinale, and an undescribed *Gymnosporangium* which occurs on bark of all ages, have been found in connection with the gradual death of red cedars in Virginia and Maryland, and by Spaulding in Connecticut. The latter fungus was probably the chief cause of the disease.

Origin of Heterœcism in the Rusts: EDGAR W. OLIVE.

Accepting the view that the heterœcious æcidium cup forms of rusts were the last in evolutionary history and that their ancestral forms were autœcious and similar to the present lepto- and micro-rusts, the paper seeks to contribute toward the question of primary and secondary hosts.

Three arguments are presented toward proof that the present gametophytic, or æcidial, host was the primary host which bore the autœcious ancestor. It is claimed that from a cytological standpoint the main proof is furnished. The stage of the sexual cell fusions is regarded as at least equal in importance to the final stage of teleutospore formation, if not indeed as the most invigorating phase of the whole life history. From a cytological standpoint it seems inconceivable that the jump to an absolutely new host could have been made by the uninucleated basidiospores resulting from the germination of the teleutospores; since the jump would be thus made at a time when the reduction occurs which changes the fungus from the presumably more vigorous diploid generation back to the primitive haploid generation. It seems, rather, more reasonable to expect that the double nucleated æcidiospores, endowed with the greatest amount of vitality from the conjugation which has just preceded them, would be thus much better adapted to make the jump to another distinct host. Reasoning from analogy, we should naturally be led to expect at this stage, following the sexual fusions, new possibilities of development and consequently new possibilities for infection of foreign protoplasm.

Such forms as the morphological species of *Puccinia graminis* are regarded as furnishing another point in favor of this theory. The fewness and evident close relationship of the gametophytic hosts argues strongly that the barberry was the original host in this case and that the vigorous æcidiospores were able in their jump over to a secondary host to infect many sorts of grasses. The third and final point brought out in favor

of the theory is the fact that several species of barberry in various parts of the world act as teleutosporic hosts for several species of rusts, thus suggesting the possibility that at one time the barberry may have acted also as an ancestral host to the teleutospores of *P. graminis*.

HENRY C. COWLES
THE UNIVERSITY OF CHICAGO

THE CENTRAL BRANCH OF THE AMERICAN SOCIETY OF ZOOLOGISTS

THE annual meeting of the American Society of Zoologists, Central Branch, was held at Iowa City, with headquarters at the State University of Iowa, on April 7 to 9. Officers were Edward A. Birge, University of Wisconsin, president; Michael F. Guyer, University of Cincinnati, vice-president; Charles Zeleny, University of Illinois, secretary-treasurer.

The meeting was an unusually successful one, the attendance being large and all but one of the large universities in the territory covered by this branch was represented by one or more zoologists.

There was an informal smoker at the Triangle Club on the evening of April 7, at which President MacLean, of the State University of Iowa, delivered an informal address. Other social features were a lunch held in the Bird Hall of the Museum of Natural History on Friday noon, and the annual dinner of the society at the Burkley Imperial on Friday evening, at which the annual address of the retiring president, Dr. Edward A. Birge, of the University of Wisconsin, was delivered.

The regular proceedings and reading of papers will be noticed later.

The following officers were elected for next meeting: Dr. C. E. McClung, of the University of Kansas, president; Dr. Henry F. Nachtrieb, of the State University of Minnesota, vice-president; Professor Herbert B. Neal, of Galesburg, Illinois, secretary. A committee on nomenclature to cooperate with the Eastern Branch, and ultimately with the International Association of Zoologists, in the revision of rules of nomenclature, was appointed, of which Professor C. C. Nutting, of the State University of Iowa, was chairman; the other members being Dr. H. B. Ward, of Illinois; Dr. S. W. Williston, of Chicago; Dr. C. A. Kofoid, of California, and Dr. C. H. Eigenmann, of Indiana.

The new laboratories of zoology, and the zoological museum were open for inspection and there was much favorable comment on the extent of the equipment, the size, and general style of the new building, and the exhibits in the museum.

SOCIETIES AND ACADEMIES

THE NEW YORK ACADEMY OF SCIENCES
SECTION OF BIOLOGY

AT the regular meeting held at the American Museum on March 14, 1910, Professor Charles B. Davenport presiding, the following papers were read:

Relation between Species and Individual in the Struggle for Existence: Dr. ALEXANDER PETRUNKEVITCH.

From examples taken from the groups of spiders and insects the speaker tried to show that the advantage of the individual is often opposed to the advantage of the species. Structures and habits dangerous to the individual but of use to the species are not uncommon. Their existence proves that the individual is "enslaved" by the species, which condition may be understood only if we consider the individual a mere carrier and protector of the germ. In the evolution of species not the characters of the fittest individual are selected and transmitted to the descendant, but those of the fittest to preserve the progeny.

A Case of Apparent Reversion among Gastropods: Miss ELVIRA WOOD.

The ornament of *Potamidopsis tricarinatum* begins as two continuous spirals, passes through a stage with two rows of nodes and interpolates a third row of nodes in the adult. *Potamidopsis trochleare* has three rows of nodes in the young, later loses the median row and has in the adult two continuous spirals. This suggests reversion in the latter species, but in *P. tricarinatum* the upper spiral disappears before the introduction of the subsutural and median rows of nodes, while in *P. trochleare* the upper continuous spiral of the adult is developed from the subsutural nodes, hence the two spirals of the adult are not equivalent to the two spirals of the young *P. tricarinatum*. *P. trochleare* illustrates progressive development resulting in simplification of structures.

The Preparation of a Museum Anatomical Model: Mr. IGNAZ MATAUSCH.

The speaker gave an account of the successive stages in the construction of an anatomical model of a spider, for museum exhibition. He exhibited a number of dissected specimens of *Lycosa* upon which the model is based, as well as a series of wax models which are made preliminary to casting the final model.

L. HUSSAKOF,
Secretary